

CLAIMS

1. A magnetic substance-encapsulated particle,
which comprises an organic polymer material and a
5 magnetic substance having an average particle size of 1 to
30 nm, the magnetic substance being contained within a
particle in a state of being dispersed.

2. The magnetic substance-encapsulated particle
10 according to claim 1,
wherein the absolute deviation of a component ratio
between a carbon element composing the organic polymer
material and a metal element composing the magnetic
substance is 0.3 or less.

15 3. The magnetic substance-encapsulated particle
according to claim 1 or 2,
wherein the magnetic substance is formed by
oxidization of a metal ion within a particle in a
20 polymerization process of forming the magnetic substance-
encapsulated particle.

4. The magnetic substance-encapsulated particle
according to claim 3,
25 wherein the metal ion is an iron ion.

5. The magnetic substance-encapsulated particle
according to claim 1, 2, 3 or 4,
wherein a main constituent of the organic polymer
30 material is a polymer comprising an acrylic monomer.

6. The magnetic substance-encapsulated particle
according to claim 5,
wherein the acrylic monomer is a monomer having a
35 glycidyl group.

7. The magnetic substance-encapsulated particle according to claim 1, 2, 3 or 4,

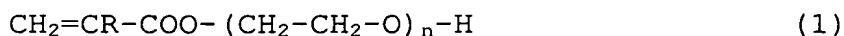
wherein a main constituent of the organic polymer material is a polymer comprising a monomer having a glycidyl group and a styrenic monomer.

8. The magnetic substance-encapsulated particle according to claim 7,

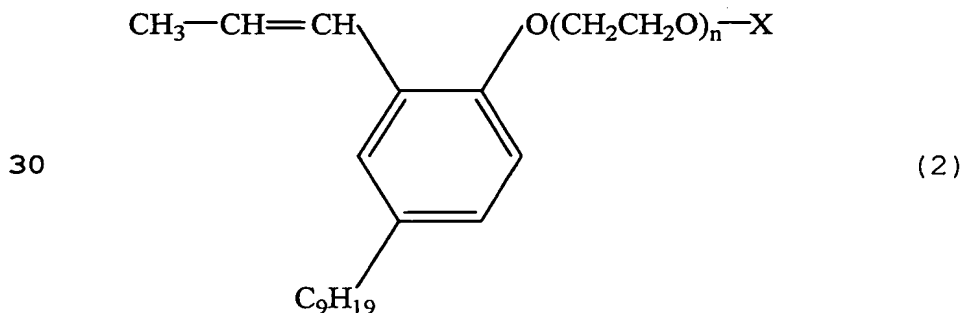
wherein the proportion of a monomer unit derived from the styrenic monomer in the organic polymer material is 5 to 90% by weight.

9. The magnetic substance-encapsulated particle according to claim 5, 6, 7 or 8,

which further has polyethylene glycol (meth)acrylate represented by the following general formula (1), or a compound represented by the following general formula (2), as a monomer component of a polymer composing the organic polymer material:



in the formula, R represents H or CH₃, and n represents an integer of 1 to 20,



in the formula, X represents H or SO₃⁻NH₄⁺, and n represents

an integer of 3 to 30.

10. The magnetic substance-encapsulated particle
according to claim 1, 2, 3, 4, 5, 6, 7, 8 or 9,
5 wherein the organic polymer material is crosslinked.

11. The magnetic substance-encapsulated particle
according to claim 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10,
which has at least a functional group selected from
10 the group consisting of a carboxyl group, a hydroxyl group,
an epoxy group, an amino group, a triethylammonium group, a
dimethylamino group and a sulfonic acid group at the
surface of the particle.

12. The magnetic substance-encapsulated particle
according to claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or 11,
15 wherein an average particle size is 0.05 to 1 μm .

13. The magnetic substance-encapsulated particle
20 according to claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 or 12,
wherein a content of the magnetic substance is 0.1 to
50% by weight.

14. The magnetic substance-encapsulated particle
25 according to claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 or
13,
wherein an average particle size of the magnetic
substance is 2 to 10 nm.

15. The magnetic substance-encapsulated particle
according to claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12,
30 13 or 14,

wherein a linker having a functional group capable of
forming a covalent bond with an antigen or an antibody
35 binds to a particle surface.

16. The magnetic substance-encapsulated particle according to claim 15,

5 wherein the functional group capable of forming a covalent bond with an antigen or an antibody is an epoxy group.

17. The magnetic substance-encapsulated particle according to claim 15 or 16,

10 wherein the linker is polyethylene glycol diglycidyl ether.

18. A method of producing a magnetic substance-encapsulated particle comprising the steps of:

15 polymerizing a monomer not having a hydrophilic group and/or a monomer having a hydrophilic group in a water solvent to form a particle; and

oxidizing a metal ion while taking in the metal ion into the particle to form a magnetic substance,

20 the step of forming a particle and the step of forming a magnetic substance being simultaneously performed.

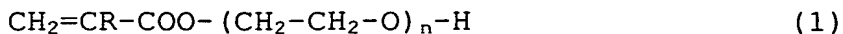
19. The method of producing the magnetic substance-encapsulated particle according to claim 18,

25 wherein the monomer not having a hydrophilic group is an acrylic monomer having a glycidyl group, or an acrylic monomer having a glycidyl group and a styrenic monomer.

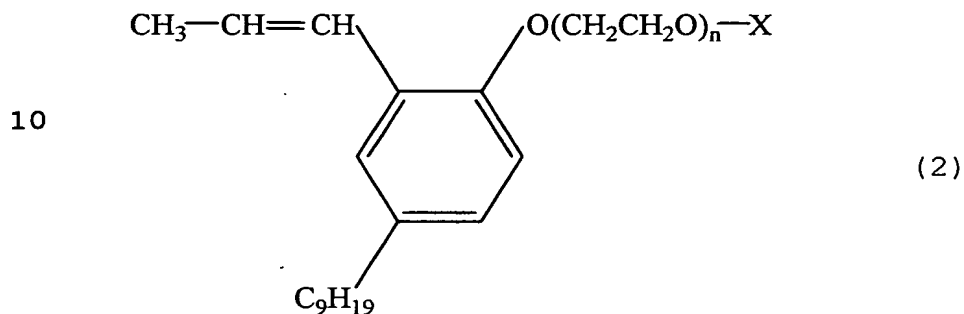
20. The method of producing the magnetic substance-encapsulated particle according to claim 18 or 19,

30 wherein a monomer to form a particle comprises a monomer not having a hydrophilic group and a monomer having a hydrophilic group, and the monomer having a hydrophilic group is polyethylene glycol (meth)acrylate represented by
35 the following general formula (1) or a compound represented

by the following general formula (2):



5 in the formula, R represents H or CH₃, and n represents an integer of 1 to 20,



in the formula, X represents H or SO₃⁻NH₄⁺, and n represents an integer of 3 to 30.

21. The method of producing the magnetic substance-
20 encapsulated particle according to claim 18, 19 or 20,
wherein in the step of forming a particle, a reactive
emulsifier is added as a copolymerization monomer.

22. The method of producing the magnetic substance-
25 encapsulated particle according to claim 18, 19, 20 or 21,
wherein in the step of forming a particle, a
polymerization initiator is added afterward.

23. A particle for immunoassay,
30 which is obtainable by adsorbing or binding an
antigen or an antibody to the magnetic substance-
encapsulated particle according to claim 1, 2, 3, 4, 5, 6,
7, 8, 9, 10, 11, 12, 13, 14, 15, 16 or 17.

35 24. A method of immunoassay,

wherein the magnetic substance-encapsulated particle according to claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 or 17, or the particle for immunoassay according to claim 23 is used.

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25. A method of immunoassay,

wherein the magnetic substance-encapsulated particle according to claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 or 17, is used as a marker.

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26. The method of immunoassay according to claim 24 or 25,

wherein an immuno chromatogram method is used.